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POWER AND EQUIPMENT ON FARMS IN 1964. 48 STATES, MAJOR ITEMS BY SIZE AND.
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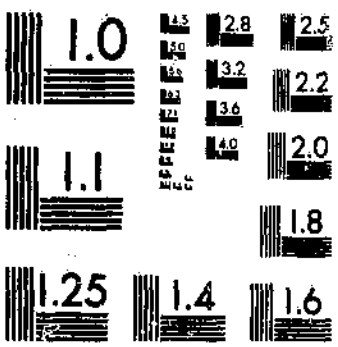

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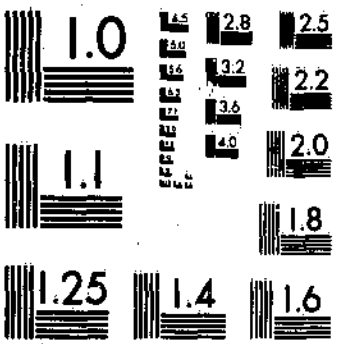

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NATIONAL BUREAU OF STANDARDS-1963-A

POWER AND EQUIPMENT ON FARMS IN 1964, 48 STATES

MAJOR ITEMS BY SIZE AND TYPE

STATISTICAL BULLETIN NO. 457
ECONOMIC RESEARCH SERVICE
U.S. DEPARTMENT OF AGRICULTURE

ABSTRACT

Distribution of field machines by size generally coincides with the distribution of wheel tractors. In 1964, the large tractors, those with 5 plow bottom rating and over (70 horsepower and larger), represented 14 to 16 percent of the total in the Delta States, Northern Plains, and Southern Plains regions only. The larger field machines were also located in these regions. By type of farm, 15 percent of the tractors on cash grain farms were large size, in contrast with 1 and 5 percent on tobacco and poultry farms, respectively. Considering equipment on the larger farms (annual gross sales of $40,000 or more), 17 percent were large size tractors. Conversely, 85 percent of the tractors on small farms had a 1-2 plow rating (25 horsepower or less). Changes in size distribution of most machines since 1964 probably have not been extensive. The large inventory of relatively small machines is the principal reason. Data on farm tractors and principal field machines were obtained from the 1964 Pesticide and General Farm Survey conducted by Economic Research Service, USDA. The survey farms accounted for about 90 percent of the total sales of agricultural products in 1964.

Key Words: Tractors, machines, farm types, farm production region, annual gross sales, tractor horsepower, plow bottom rating, self-propelled machines, pull or mounted machines, and field machines.

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CONTENTS

SUMMARY

Farm equipment in the larger size groups, efficiently utilized, aids in minimizing farm production costs per unit of output. Cost advantages can occur with substitution of machines for labor and substitution of large machines for small ones, particularly if timeliness is a factor.

Generally, U.S. farms are equipped with relatively small machines. However, beginning with the last decade, farmers have been purchasing larger and larger ones. These include power units and equipment to accompany them, along with self-propelled units.

As these larger pieces of equipment enter the inventory on farms, the annual increase in average size will accelerate. Two factors will contribute to this acceleration: (1) increasing discard rates for older, small machines, and (2) concentration of purchases of the larger size machines. With increasing size of equipment, more aggregate output may be achieved with less labor and machine time.

Machine size by region, type of farm, and size of farm may be illustrated by size of tractor. In extensive farming regions such as the Northern Plains, Southern Plains, and the Delta States, the average size of tractors is much larger than elsewhere in the country. These were the only regions where wheel tractors of five- and six-plow bottoms exceeded 10 percent of the total in 1964.

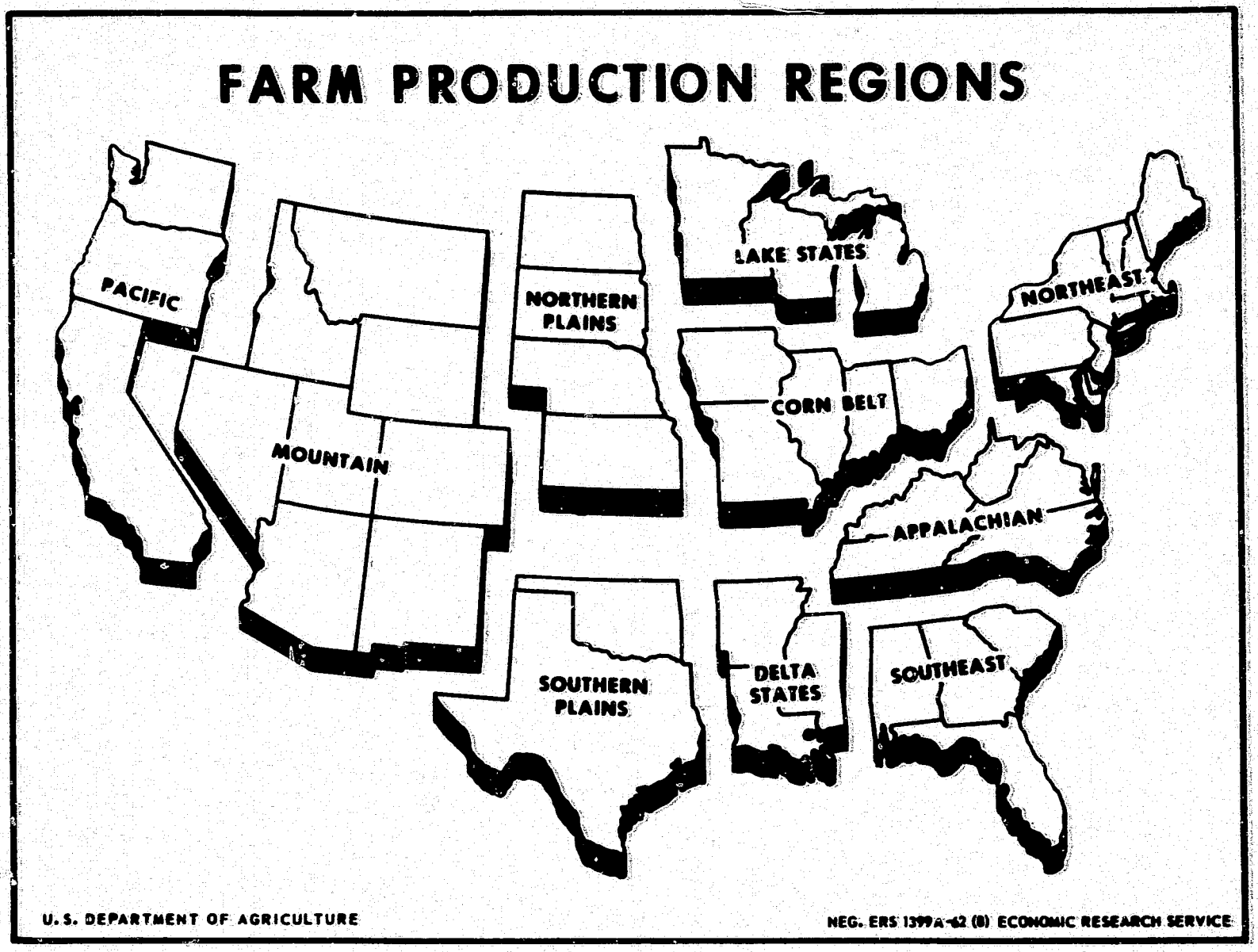
Similarly, type of farm is related to machine size. Those types with large acreages and large fields had large equipment. For example, cash grain farms and cotton farms were the only types with 10 percent or more of the tractors of five- and six-plow-bottom size.

Regarding size of farm and size of tractors, on farms with $40,000 or more of annual sales, 17 percent of the wheel tractors were five- and six-plow-bottom size but only 1 percent was over six-plow-bottom size. In contrast, for small farms in the South (under $5,000 of sales), 85 percent of the wheel tractors were one- and two-plow-bottom size in 1964.

Distribution of self-propelled machines (mainly combines and cotton pickers) by size generally followed the pattern of tractor size distributions. However, the Mountain States had the highest percentage of large combines (cutting width of 18 feet and over)--4 percent.

Displacement of farm labor by machines has been a problem in some areas. Mechanical cotton pickers did the work of 1.7 million hand pickers by 1964, and mechanical cotton strippers the work of 0.7 million hand snappers. These figures are based on the worker displacement ratio of 25 workers per row of picking machine capacity and 10 per row of stripping machine capacity. Labor planning and management in advance of further mechanization into tobacco, fruit, and vegetable production will tend to minimize the problem of human resource adjustment.1/

1/ Recognition of the problem and accomplishments in this area are illustrated by the following reports: Potential Mechanization in the Flue-Cured Tobacco Industry, with Emphasis on Human Resource Adjustment. U.S. Dept. Agr., Econ. Res. Serv., Agr. Econ. Res. Rpt. No. 169, Sept. 1969 and Fruit and Vegetable Harvest Mechanization, Technological Implications, Michigan State Univ., Rural Manpower Center Rpt. No. 16, May 1969. Later Michigan State Univ. reports will include: Manpower Implications, RMC Report No. 17, and Policy Implications, RMC Report No. 18.


FARM PRODUCTION REGIONS
PACIFIC
MOUNTAIN
NORTHERN PLAINS
LAKE STATES
CORN BELT
NORTHEAST
APPALACHIAN
SOUTHERN PLAINS
DELTA STATES
SOUTHEAST
U. S. DEPARTMENT OF AGRICULTURE
NEG. ERS 1399A-62 (8) ECONOMIC RESEARCH SERVICE

POWER AND EQUIPMENT ON FARMS IN 1964, 48 STATES
Major Items by Size and Type

by

Paul E. Strickler, Agricultural Economist
Farm Production Economics Division
Economic Research Service

INTRODUCTION

Numbers of principal machines on farms have been available from census reports for decades. When little difference existed in sizes of machines, the number of machines served fairly well as an indicator of machine inputs and mechanical capability for labor substitution. During the 1960's, sizes of machines used by farmers increased rapidly, and self-propelled machines began taking on an increasing share of the work, especially in harvesting. This development points up the need for additional information on size and type of machines being used and distribution of these machines.

Objectives in this study are to determine the size and type of machines used by farmers by (1) farm production regions, 1/ (2) type of farm, and (3) size of farm as measured by annual gross sales.

Supplemental data on machine performance and costs, additional tractor data, and the questionnaire used in the survey discussed below are presented in the appendix.

Findings in this report are based on data from an ERS sample survey 2/ conducted in 1965, primarily to measure the extent and cost of pesticide use on farms in 1964. Enumeration covered 10,800 farmers in 417 counties throughout the 48 contiguous States. In three southern regions (Appalachian, Southeast, and Delta States), the survey included farms with annual gross sales of $2,500 or more. In the remaining States, only farms with $5,000 or more of annual gross sales were included. Useable data on machines were available for all farm types within these sales limits, except fruit and nut, and vegetable farms.

Farms represented in the pesticide survey accounted for 90 percent of total agricultural sales in the United States in 1964 and 90 percent of the cotton pickers, self-propelled combines, corn heads, and hay conditioners. However, they had less than 70 percent of the tractors. Essentially, the machines included in the survey are those involved in nearly 90 percent of the Nation's farm production. The part of the inventory not included is composed largely of small machines on small

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1/ See map on page vi for farm production regions.
2/ 1964 Pesticide and General Farm Survey.

farms, where they get limited use. Also, most of the machines on these small farms were purchased as used equipment or were purchased some time during the late 1940's or the early part of the 1950's and now involve little investment.

Total numbers of machines represented in the ERS survey could be estimated in most instances from data in the 1964 Census of Agriculture or from the 1964 census sample survey of agriculture. These numbers were then distributed by regions, types of farm, and farms by annual gross sales, as determined from the ERS survey. Size and type of machine distributions are those determined in the ERS survey. For windrowers or swathers, and cotton strippers, no current estimates of numbers on farms are available. ERS survey data, statistics on manufacturers shipments for domestic use, and earlier estimates on the number of cotton strippers were all used in arriving at totals for these machines.

Sales of large-size machines have accelerated since the ERS survey was made. However, data on size distributions obtained in 1965 should still fairly accurately reflect current distribution, and serve as a base to measure future changes.

Changes in size distribution for most machines since 1964 would be relatively small, mainly because of the large inventory of small-size machines. Sales of large wheel tractors may be used as an illustration. Since 1964, sales of wheel tractors with 100 or more horsepower amounted to less than 2 percent of the tractor inventory in the study. But continuing sales of large machines, coupled with high discard rates for older ones, will contribute to an accelerating trend toward larger machines on farms.

Tractor sizes in this study were measured in plow bottoms. Comparisons of horsepower and plow bottoms are presented in appendix table 1. Appendix table 2 and figure 1 show the relationship between tractor size and cost of operation per hour and per acre of plowing.

POWER AND FIELD MACHINES

Wheel Tractors

Standard wheel tractors now range from 9 to 140 or more horsepower (maximum power takeoff) and are capable of pulling from one to eight or more plow bottoms. With few exceptions, field machines are pulled with or mounted on tractors.

It follows that size of tractors fairly well reflects sizes of machines to be used with them. On many farms, machines may be somewhat larger than would be necessary in a normal season. Good machinery management will include an insurance factor in the form of a larger machine to aid in combating unfavorable weather. 3/

The inventory of wheel tractors on farms, however, is composed mainly of the smaller size units, as indicated in table 1. In 6 of the 10 regions, one- and two-plow bottom sizes of tractors predominated; and only the Northern Plains, Delta States, and Southern Plains had more

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3/ Equipment Technology and Weather on Rice Farms in the Grand Prairie, Arkansas. Part 1: Farm Organization and Risk. Ark. AES. Bul. 734, Dec. 1968.

Table 1.--Number of farms reporting wheel tractors, number on farms, and percentage by plow-bottom size, by farm production region, type of farm, and annual gross sales of farmers; United States, 1964 1/

Item	Number of--		Percentage by plow-bottom size			
	Farms	Tractors	One- or two-plow	Three- or four-plow	Five- or six-plow	Over six-plow
	----Thousands-----		----------Percent----------			
Region:						
Northeast	84.6	214.2	55	41	4	2/
Lake States	188.9	471.9	51	46	3	2/
Corn Belt	367.2	884.9	39	55	6	2/
Northern Plains	178.3	453.3	34	52	13	1
Appalachian	192.9	350.8	67	30	3	--
Southeast	59.5	108.7	64	33	3	2/
Delta States	68.7	161.5	37	47	14	2
Southern Plains	76.6	186.3	30	55	14	1
Mountain	70.0	195.6	62	30	7	1
Pacific	34.3	77.6	55	41	4	2/
All regions	1321.0	3104.8	46	46	7	2/
Type of farm:						
Cash grain	260.2	661.3	29	56	14	1
Tobacco	114.9	180.1	82	17	1	--
Cotton	88.5	229.8	37	53	10	2/
Other field crop	15.9	37.3	59	37	4	2/
Poultry	1.3	3.1	63	32	5	--
Dairy	321.0	751.4	54	43	3	2/
Other livestock	251.0	568.2	46	50	4	2/
Livestock ranches	29.1	83.7	44	47	9	2/
General and miscellaneous	239.1	589.9	48	44	7	2/
All farm types	1321.0	3104.8	46	46	7	2/
Annual gross sales:						
$40,000 or more	113.6	447.0	30	52	17	1
$20,000 to $39,999	240.4	680.0	39	52	9	1
$10,000 to $19,999	472.9	1096.0	46	49	5	2/
$5,000 to $9,999	413.5	782.4	58	39	3	2/
$2,500 to $4,999 3/	80.6	99.4	85	14	1	2/
All sales groups	1321.0	3104.8	46	46	7	2/

1/ Excludes Alaska and Hawaii. Fruit and nut, and vegetable farms are excluded.
2/ Less than 0.5 percent.
3/ Includes farms in the Appalachian, Southeast, and Delta States regions only.

than 10 percent of the wheel tractors in the five- and six-plow bottom sizes in 1964. From 1940 to 1964, horsepower per tractor on farms had risen 44 percent and is expected to double by 1974 (see fig. 2 in the app.).

By type of farm, most of the tractors on tobacco and poultry farms were one- and two-plow-bottom size. Cash grain and cotton farms, where operations are more extensive, had 10 percent or more of the tractors in the five- and six-plow-bottom sizes.

Large farms ($40,000 or more of sales) had 17 percent of the wheel tractors in the five- and six-plow-bottom sizes and 1 percent over six-plow-bottom size. In contrast, most of the tractors (85 percent) on small farms in the South were one- and two-plow-bottom size.

Crawler Tractors

According to census findings, the number of crawler tractors on farms reached a peak around 1959 and has declined slightly since. A general decline has been evident over most of the country. Only the Southeast and Delta States have shown moderate increases in number of crawlers. Crawlers have been used principally on irrigated land and steep orchard sites. Large-size wheel tractors, which may be equipped with high flotation tires and dual wheels, have no doubt contributed to some of the decline in use of crawlers.

Like size of wheel tractors, crawler size was measured in plow bottoms in this study. Small-size crawlers were generally found in the Northeast and Southeast regions, where farms were relatively small. Some of the use was on potato farms in the Northeast, particularly in Pennsylvania. Larger crawlers were more prevalent in the Delta, Mountain, and Pacific States (table 2). Uses here include land leveling and forming, deep plowing, and chiseling, all jobs where the power and traction of large crawlers offer advantages.

Sizes of crawlers by type of farm varied widely. One-third of those on cash grain farms were over six-plow-bottom size. On dairy and other livestock farms only 7 percent were this large. Forty-four percent were one- and two-plow-bottom size.

Because of the investment required and the extensive use needed for economy, the larger farms had higher percentages of large-size crawlers. On farms with $40,000 or more of annual sales, 35 percent of the crawlers were over six-plow-bottom size. But on farms with sales of $10,000 or less, large crawlers represented less than 10 percent of the total.

Row Planters

Most farms producing row crops have one or more row planters ranging in size capacity from one to 12 or more rows. Units available for tool bar mounting are flexible as to row width as well as number of rows.

Size of planters on survey farms throughout the 48 States were about equally divided between one- and two-row and three-row and larger.

Only half the regions had 50 percent or more of the planters three-row or larger, with the Pacific showing 78 percent in the larger sizes (table 3). Small one- and two-row corn and cotton planters in the

Table 2.--Number of farms reporting crawler tractors, number on farms, and percentage by plow-bottom size, by farm production region, type of farm, and annual gross sales of farmers, United States, 1964 1/

Item	Number of--		Percentage by plow-bottom size			
	Farms	Tractors	One- or two-plow	Three- or four-plow	Five- or six-plow	Over six-plow
	----Thousands-----		----------Percent----------			
Region:						
Northeast	6.9	10.3	55	33	5	7
Lake States	5.6	8.0	40	35	20	5
Corn Belt	12.3	15.1	31	45	16	8
Northern Plains	7.5	9.8	24	46	20	10
Appalachian	6.7	7.4	41	41	9	9
Southeast	1.5	1.6	50	33	--	17
Delta States	1.5	1.5	9	36	--	55
Southern Plains	4.1	6.4	25	39	19	17
Mountain	17.2	20.4	18	22	40	20
Pacific	20.6	28.8	13	22	34	31
All regions	83.9	109.3	26	32	24	18
Type of farm:						
Cash grain	23.6	32.1	9	24	34	33
Tobacco and cotton	6.5	8.1	26	29	27	18
Dairy and other livestock	25.4	32.2	44	40	9	7
Livestock ranches	3.8	5.6	28	26	36	10
Other farm types 2/	24.6	31.3	25	33	27	15
All farm types	83.9	109.3	26	32	24	18
Annual gross sales:						
$40,000 or more	21.3	30.6	10	22	33	35
$20,000 to $39,999	19.8	26.0	20	33	28	19
$10,000 to $19,999	25.1	31.5	43	30	20	7
$5,000 to $9,999	16.6	20.1	33	45	13	9
$2,500 to $4,999 3/	1.1	1.1	25	75	--	--
All sales groups	83.9	109.3	26	32	24	18

1/ Excludes Alaska and Hawaii. Fruit and nut, and vegetable farms are excluded.
2/ Other field crops, general, and miscellaneous.
3/ Includes farms in the Appalachian, Southeast, and Delta States regions only.

Table 3.--Number of farms reporting row planters, number on farms, and percentage by row size, by farm production region, type of farm, and annual gross sales of farmers, United States, 1964 1/

Item	Number of--		Percentage by row size	
	Farms	Planters	One-or two-row	Three-row or more
	Thousands		Percent	
Region:				
Northeast	53.8	55.7	82	18
Lake States	146.8	150.9	56	44
Corn Belt	298.2	310.0	31	69
Northern Plains	110.4	118.5	45	55
Appalachian	126.8	143.9	90	10
Southeast	48.3	57.7	88	12
Delta States	47.4	57.7	53	47
Southern Plains	45.6	75.0	31	69
Mountain	25.6	33.4	31	69
Pacific	9.1	10.2	22	78
All regions	912.0	1013.0	52	48
Type of farm:				
Cash grain	173.3	193.5	26	74
Tobacco	73.9	84.1	97	3
Cotton	73.0	103.3	43	57
Other field crop	11.8	14.2	63	37
Dairy	218.9	225.9	73	27
Other livestock	196.0	202.6	40	60
Other farm types 2/	165.1	189.4	50	50
All farm types	912.0	1013.0	52	48
Annual gross sales:				
$40,000 or more	82.1	112.4	20	80
$20,000 to $39,999	175.1	197.5	32	68
$10,000 to $19,999	331.0	357.6	52	48
$5,000 to $9,999	273.6	292.8	70	30
$2,500 to $4,999 3/	50.2	52.7	99	1
All sales groups	912.0	1013.0	52	48

1/ Excludes Alaska and Hawaii. Fruit and nut, and vegetable farms are excluded.
2/ Livestock ranches and general.
3/ Includes Farms in the Appalachian, Southeast, and Delta States regions only.

Appalachian and Southeast and corn planters in the Northeast accounted for 82 to 90 percent of the planters in those regions.

Cash grain farms lead among types of farms in the percentage of planters that were three-row and larger, with 74 percent. On these farms, extensive acreages of corn and soybeans are planted. Planters on dairy farms were relatively small, with 73 percent in the one- and two-row size. On tobacco farms, only 3 percent were larger than one- or two-row.

Only farms with sales above $20,000 had more three-row and larger planters than planters less than three-row.

Combines

Of the many machines available as self-propelled units, only the combine has been accepted by farmers in large volume. In 1960, when the number of combines on farms was near the peak at over 1 million, about 25 percent were self-propelled. These quarter of a million combines accounted for over 50 percent of the acreage harvested with combines at the time.4/ Since then, more corn and other crops have been included in the harvest area of this versatile machine.

Current sales show demand for self-propelled combines to be over 95 percent of the total number of combines sold, whereas as late as 1955, shipments of self-propelled units amounted to only one fourth of the total. Many of the early self-propelled combines were relatively small, with a cutting width of only 7 feet. Of the self-propelled combines reported on in the 1964 ERS survey, over half cut less than 13 feet at a pass (table 4).

Smaller self-propelled combines (under 13 feet) ranged from 18 percent of the total in the Southern Plains to 92 percent in the Northeast States. Large sizes (18 feet and over) amounted to only 4 percent of the total in the Mountain States, the region with the highest percentage of large combines.

Relatively few types of farms have sufficient grain acreage to justify ownership of very large combines. Only cash grain and general farms had any, and there just 2 percent of the respective totals were in the largest size category (18 feet and over).

Over half the self-propelled combines were on farms having gross annual sales of $20,000 or more, and only 15 percent were on farms with less than $10,000 of sales. Only farms with $20,000 or more gross sales had combines as large as 18 or more feet in width of cut.

Pull-type combines, after many decades of service, have seen less and less service since the advent of the self-propelled combine. In 1964, about three-fourths of the pull-type combines were in the 6- to 9-foot size (table 5). Larger sizes (over 12 feet) comprised important percentages of the total in only the Pacific and Delta States regions. In the Corn Belt and Lake States, where more than 60 percent of the pull-type combines were located in 1964, most were relatively small (under 10 feet); and in the Corn Belt, about one-fifth were under 6 feet.

Considering types of farms, dairy and livestock farms had almost 60 percent of all pull-type combines. Nearly all of the combines used on these farms were under 10 feet in width of cut, and 20 percent were under

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4/ U.S. Bureau of the Census. 1959 Census of Agriculture. Vol. V., Special Reports--Part 5, 1960 Sample Survey of Agriculture.

Table 4.--Number of farms reporting self-propelled combines, number on farms, and percentage by cutting width, by farm production region, type of farm, and annual gross sales of farmers, United States, 1964 1/

Item	Number of--		Percentage			
	Farms	Combines	Under 13 feet	13-14 feet	15-17 feet	18 feet and over
	----Thousands----		----------Percent----------			
Region:						
Northeast	7.7	8.0	92	8	--	--
Lake States	24.4	26.0	82	15	3	2/
Corn Belt	82.2	85.1	76	24	--	--
Northern Plains	75.7	83.0	39	47	12	2
Appalachian	15.1	17.8	53	47	--	--
Southeast	3.0	3.1	88	12	--	--
Delta States	14.5	20.2	38	59	3	--
Southern Plains	23.0	28.5	18	68	11	3
Mountain	19.5	22.7	22	51	23	4
Pacific	9.0	11.9	31	45	21	3
All regions	274.1	306.3	52	40	7	1
Type of farm:						
Cash grain	123.6	143.3	46	43	9	2
Tobacco	2.2	2.4	90	10	--	--
Cotton	16.7	19.3	30	67	3	--
Other field crop	2.8	2.8	62	29	9	--
Dairy	25.8	27.0	82	14	4	--
Livestock	36.7	37.1	82	18	2/	--
Livestock ranches	9.3	9.8	54	36	10	--
General	57.0	64.6	42	46	10	2
All farm types	274.1	306.3	52	40	7	1
Annual gross sales:						
$40,000 or more	55.4	71.7	36	51	11	2
$20,000 to $39,999	73.2	83.3	51	40	7	2
$10,000 to $19,999	99.5	104.4	60	34	6	2/
$5,000 to $9,999	45.7	46.6	61	33	6	2/
$2,500 to $4,999 3/	0.3	0.3	100	--	--	--
All sales groups	274.1	306.3	52	40	7	1

1/ Excludes Alaska and Hawaii. Fruit and nut, and vegetable farms are excluded.
2/ Less than 0.5 percent.
3/ Includes farms in the Appalachian, Southeast, and Delta States regions only.

Table 5.--Number of farms reporting pull-type grain combines, number on farms, and percentage by cutting width, by farm production region, type of farm, and annual gross sales of farmers, United States, 1964 1/

Item	Number of--		Percentage by size of combine			
	Farms	Combines	Under 6 feet	6-9 feet	10-12 feet	Over 12 feet
	Thousands		Percent			
Region:						
Northeast	23.3	23.4	16	83	1	--
Lake States	98.6	101.6	15	81	4	--
Corn Belt	176.4	182.4	19	79	1	1
Northern Plains	54.0	57.8	12	51	33	4
Appalachian	25.8	26.8	20	77	2	1
Southeast	4.1	4.3	16	78	6	--
Delta States	4.1	4.3	23	45	16	16
Southern Plains	8.6	9.3	22	66	10	2
Mountain	10.2	11.0	29	49	18	4
Pacific	4.1	4.3	7	33	17	43
All regions	409.2	425.2	17	74	7	2
Type of farm:						
Cash grain	79.0	84.2	10	68	17	5
Tobacco	11.1	11.5	25	72	1	2
Cotton	6.5	6.8	15	85	--	--
Other field crop	4.1	4.2	6	82	12	--
Dairy	126.0	128.8	19	79	2	--
Livestock	112.5	116.1	20	78	2	--
Livestock ranches	7.8	8.1	5	61	32	2
General	62.2	65.5	18	66	13	3
All farm types	409.2	425.2	17	74	7	2
Annual gross sales:						
$40,000 or more	19.3	20.8	9	78	10	3
$20,000 to $39,999	77.7	81.7	13	78	6	3
$10,000 to $19,999	175.1	181.2	16	75	7	2
$5,000 to $9,999	133.0	137.3	22	69	8	1
$2,500 to $4,999 2/	4.1	4.2	25	68	7	--
All sales groups	409.2	425.2	17	74	7	2

1/ Excludes Alaska and Hawaii. Fruit and nut, and vegetable farms are excluded.
2/ Includes farms in the Appalachian, Southeast, and Delta States regions only.

6 feet. Many of these farms, particularly dairy farms, had limited acreages in crops to be combined.

Over 75 percent of the pull-type combines were on farms with less than $20,000 of annual sales. A higher percentage of the larger combines were on the larger farms, but many of the larger combines probably were moved to smaller sized farms as self-propelled ones replaced them. This tended to level out size distributions somewhat.

Corn Heads for Combines

Rapid adoption of corn heads for combines extended the use of this versatile machine still further. In 1964, about 24 percent of the corn acreage was field shelled by combines. By 1968, this percentage had about doubled.5/

Most of the earlier machines and attachments were relatively small, and corn heads were no exception. As late as 1964, nearly 90 percent of the sales were of the two-row size, but 60 percent of those sold in 1969 were three-row and larger.

In 1964, two-row corn heads represented 88 percent of the total on farms in the survey (table 6). This was also the case in the Corn Belt, where over half the corn heads were in that year. Little variation in size of corn heads was evident among the regions except in the Southern Plains, where 30 percent of the total were three-row and larger. Only 4 percent were in this category in the Southeast.

Type of farm had little influence on size of corn heads. Cash grain and livestock farms had the highest percentage of three-row or larger corn heads--14 percent in each.

Even on the larger farms in 1964, less than 20 percent of the corn heads were three-row or larger. Size distributions on the remaining farms varied only slightly from the national average, except that on small farms all the machines were two-row.

Corn Picker-Shellers

Three types of field picker-shellers are available: pull, mounted, and self-propelled. The self-propelled type was omitted in this survey because of the small number manufactured.

Most of the picker-shellers on which farmers reported were the two-row mounted type. The Corn Belt, with more than one-half of the picker shellers in 1964, had 73 percent of them in the two-row mounted category (table 7).

Types of farms accounting for most of the corn had a similar pattern of distribution. Two-row mounted machines accounted for 71 percent of those on other livestock farms, 67 percent on dairy farms, and 58 percent on cash grain farms.

5/ Based on 1968 data for 4 States with over half the U.S. corn acreage (Ill., Iowa, Ind., and Minn.).

Table 6.--Number of farms reporting corn heads, number on farms, and percentage by size of corn head, by farm production region, type of farm, and annual gross sales of farmers, United States, 1964 1/

Item	Number of--		Percentage by size of cornhead	
	Farms	Corn heads	Two-row	Three-row or more
	Thousands		Percent	
Region:				
Lake States	6.4	6.6	86	14
Corn Belt	41.9	43.3	88	12
Northern Plains	12.2	12.2	89	11
Appalachian	10.0	11.0	90	10
Southeast	2.8	3.1	96	4
Southern Plains	1.2	1.2	70	30
Other regions 2/	2.5	2.6	91	9
All regions	77.0	80.0	88	12
Type of farm:				
Cash grain	38.5	39.9	86	14
Tobacco	1.7	1.8	89	11
Cotton	1.9	1.9	94	6
Other field crops	1.2	1.2	90	10
Dairy	3.6	4.1	88	12
Other livestock	16.5	16.8	90	10
Livestock	0.7	0.7	86	14
General	12.9	13.6	91	9
All farm types	77.0	80.0	88	12
Annual gross sales:				
$40,000 or more	22.3	24.4	82	18
$20,000 to $39,999	23.3	23.8	91	9
$10,000 to $19,999	24.7	25.1	91	9
$5,000 to $9,999	6.6	6.6	90	10
$2,500 to $4,999 3/	0.1	0.1	100	--
All sales groups	77.0	80.0	88	12

1/ Excludes Alaska and Hawaii. Fruit and nut, and vegetable farms are excluded.
2/ Northeast, Delta States, Mountain, and Pacific regions.
3/ Includes farms in the Appalachian, Southeast, and Delta States regions only.

Table 7.--Number of farms reporting corn picker-shellers, number on farms, and percentage by row size, by farm production region, type of farm, and annual gross sales of farmers, United States, 1964 1/

Item	Number of--		Percentage by row size and type			
			One-row		Two-row	
	Farms	Picker-shellers	Pull	Mounted	Pull	Mounted
	----Thousands----		----------Percent----------			
Region:						
Lake States	3.7	3.8	9	17	26	48
Corn Belt	17.7	18.0	2	12	13	73
Northern Plains	4.7	5.0	13	26	26	35
Other regions 2/	3.9	4.2	38	27	8	27
All regions	30.0	31.0	9	17	16	58
Type of farm:						
Cash grain	9.2	9.3	4	19	19	58
Dairy	2.8	2.9	17	11	5	67
Other livestock	12.3	12.6	6	9	14	71
General	4.4	4.7	17	28	24	31
Other farm types 3/	1.3	1.5	33	45	--	22
All farm types	30.0	31.0	9	17	16	58
Annual gross sales:						
$40,000 or more	6.7	7.0	4	18	12	66
$20,000 to $39,999	9.4	9.6	2	15	17	66
$10,000 to $19,999	10.2	10.6	10	19	15	56
$5,000 to $9,999	3.6	3.7	32	13	23	32
$2,500 to $4,999 4/	.1	.1	100	--	--	--
All sales groups	30.0	31.0	9	17	16	58

1/ Excludes Alaska and Hawaii. Fruit and nut, and vegetable farms are excluded.
2/ Southeast, Delta States, and Southern Plains regions.
3/ Tobacco, cotton, other field crops, poultry, and livestock ranches.
4/ Includes farms in the Appalachian, Southeast, and Delta States regions only.

On farms with $20,000 or more of gross sales, two-thirds of the picker-shellers were the two-row mounted type. All of the machines on farms with less than $5,000 of sales were one-row pull type.

Corn Pickers

For more than half a century, the corn picker was the principal machine in the mechanized corn harvest, only recently giving way to field picker-shellers.

Because of many farms having small acreages of corn, the one-row machine predominated for many years. A self-propelled corn picker was introduced in 1946 but never gained much acceptance.

In 1964, two-row mounted corn pickers accounted for 43 percent of corn pickers on farms included in the survey (table 8). But only the Corn Belt, with 58 percent, was much above the national average for this size and type of machine. Self-propelled units represented 2 percent of the pickers in the Corn Belt but only 1 percent in the country.

With regard to type of farm, only other livestock and cash grain farms had more than half of the pickers in the two-row mounted category. On cash grain farms, 3 percent of the pickers were self-propelled.

By sales classes, the predominant type of picker on large farms was the two-row mounted; on small farms, the one-row pull type. Only 3 percent of the pickers on the farms in the largest sales group were self-propelled.

Hay Conditioners

The quality and quantity of the hay crop no doubt has been substantially improved by the use of hay conditioners, particularly in the humid regions. The principal function of the machine is to crack the stem of the plant to promote uniform and faster drying of the crop. Two main types are available: (1) crimpers and (2) crushers.

During the first 10 years after commercial production of this machine was started in 1945, shipment data were not available. Shipments soared from less than 500 units in 1955 to nearly 50,000 units in 1959, the peak year. In recent years, combination mower conditioners and windrower-swather conditioners have been rapidly accepted because of the ability of these machines to do two or three operations in one pass over the field.

Of all types of conditioners in use, farmers reported 60 percent in the crimper classification (table 9). Also, each region had more crimpers than crushers. In the more humid areas, there was a higher percentage of crushers than elsewhere. In the Northeast, for example, 46 percent were crushers.

Considering distribution by type of farm, most of the conditioners were on dairy and livestock farms, where hay was an important crop. A slightly higher percentage of conditioners on livestock farms were of the crimper type--66 percent, compared with 59 percent on dairy farms.

Size of hay acreage apparently had some influence on the type of conditioner used. According to the 1964 Census of Agriculture, livestock

Table 8.--Number of farms reporting corn pickers, number on farms, and percentage by row size and type, by farm production region, type of farm, and annual gross sales of farmers, United States, 1964 1/

Item	Number of--		Percentage by size and type				
			One-row		Two-row		
	Farms	Corn pickers	Pull	Mounted	Pull	Mounted	Self-propelled
	----Thousands----		----------Percent----------				
Region:							
Northeast	19.5	20.9	63	11	7	19	--
Lake States	89.2	92.1	47	6	18	29	--
Corn Belt	210.8	220.3	18	7	15	58	2
Northern Plains	55.7	57.8	22	12	20	45	2
Appalachian	28.1	29.8	65	16	4	14	1
Southeast	11.9	12.9	53	33	2	12	--
Delta States	3.8	4.0	44	44	3	9	--
Southern Plains	3.0	3.6	50	13	6	28	3
Mountain	3.0	3.6	55	19	10	16	--
Pacific	--	--	--	--	--	--	--
All regions	425.0	445.0	32	9	14	43	1
Type of farm:							
Cash grain	90.5	94.8	17	6	19	55	3
Tobacco	13.1	13.8	68	19	3	10	--
Cotton	6.0	6.2	42	35	4	19	--
Other field crop	3.0	3.6	59	9	10	22	--
Dairy	108.4	112.6	53	9	11	26	1
Other livestock	134.7	140.2	22	8	14	55	1
Livestock ranches	6.8	7.1	38	8	20	34	--
General	62.5	66.7	29	13	17	40	1
All farm types	425.0	445.0	32	9	14	43	1
Annual gross sales:							
$40,000 or more	32.3	35.2	12	7	11	67	3
$20,000 to $39,999	91.8	95.2	17	10	16	55	2
$10,000 to $19,999	174.3	182.0	31	9	16	43	1
$5,000 to $9,999	119.8	125.0	48	9	13	29	1
$2,500 to $4,999 2/	6.8	7.6	66	27	--	7	--
All sales groups	425.0	445.0	32	9	14	43	1

1/ Excludes Alaska and Hawaii. Fruit and nut, and vegetable farms are excluded.
2/ Includes farms in the Appalachian, Southeast, and Delta States regions only.

Table 9.--Number of farms reporting hay conditioners, number on farms, and percentage by type of conditioner, by farm production region, type of farm, and annual gross sales of farmers, United States, 1964 1/

Item	Number of--		Percentage by type	
	Farms	Hay conditioners	Crimper	Crusher
	Thousands		Percent	
Region:				
Northeast	45.2	46.1	54	46
Lake States	56.7	57.4	60	40
Corn Belt	36.3	36.4	63	37
Northern Plains	4.0	4.0	81	19
Appalachian	12.0	12.3	61	39
Mountain	3.9	3.9	64	36
Pacific	2.7	2.7	68	32
Other regions 2/	5.9	5.9	56	44
All regions	166.7	168.7	60	40
Type of farm:				
Cash grain	9.5	9.8	66	34
Dairy	118.5	119.9	59	41
Other livestock	22.5	22.6	66	34
General	12.5	12.7	56	44
Other farm types 3/	3.7	3.7	67	33
All farm types	166.7	168.7	60	40
Annual gross sales:				
$40,000 or more	18.2	18.6	62	38
$20,000 to $39,999	47.8	48.1	61	39
$10,000 to $19,999	69.4	70.0	60	40
$5,000 to $9,999	30.1	30.8	60	40
$2,500 to $4,999 4/	1.2	1.2	57	43
All sales groups	166.7	168.7	60	40

1/ Excludes Alaska and Hawaii. Fruit and nut, and vegetable farms are excluded.
2/ Southeast, Delta States, and Southern Plains regions.
3/ Tobacco, cotton, other field crops, poultry, and livestock ranches.
4/ Includes farms in the Appalachian, Southeast, and Delta States regions only.

farms had a higher average hay acreage than dairy farms. This tendency is borne out somewhat by the distribution of conditioners on farms by sales groups; there was a slight increase in percentage of crimpers as size of farm increased.

Windrowers or Swathers

Windrowers or swathers, used for many years to windrow small grain, are gaining rapid acceptance for cutting hay. Modern machines may be used as windrowers or as swathers, depending on location and weather. Generally larger than mowers, these machines equipped with conditioners, make it possible to prepare large acreages of hay for rapid curing in record time.

Early machines were pulled by tractors, but self-propelled ones have recently accounted for about 90 percent of sales to farmers. In 1964, pull-type machines were predominate, representing 75 percent of the total (table 10).

Almost two-thirds of the windrowers or swathers were in the Northern Plains and Lake States. The Northern Plains had 37 percent of the total. Much of the use in this region is for windrowing small grain. Because of the presence of many older machines, 77 percent of the windrowers in this region were pull-type. In the Mountain and Pacific regions, self-propelled units comprised about 75 percent of the total. Climate, relatively large acreages of hay, and more recent acquisition of the machines were all contributing factors to the high percentage of self-propelled units in these regions.

Distribution of windrowers or swathers by type was rather uniform among types of farms where hay and grain are important crops. Livestock farms, where only 11 percent of the machines were self-propelled, were an exception. General farms had the highest proportion--33 percent--of the windrowers or swathers in the self-propelled category. Considering distribution by size of farm, small farms reported only pull-type machines. The trend toward self-propelled machines was pronounced as size of farm increased. On farms with $40,000 or more of sales, nearly half the machines were self-propelled. Along with more of the larger farms having sufficient hay acreage to justify self-propelled machines, many were in areas where both hay and grain could be cut.

Pickup Balers

Few machines have had the rapid acceptance accorded the automatic tie pickup baler. Early hand-tie types required a crew of three to four to operate the baling system. Now, one man with a baler equipped with a bale thrower can do the same job and the bales are ready for transport. Also bales may be dropped in place and picked up later by mechanical methods.

Two types of balers are available, designated by the type of tying material. In the early days of the pickup baler, hay to be shipped was traditionally tied with wire. In this way, a more compact and heavier bale was made and less breakage was experienced. Areas where much of the hay is grown for sale still bale a high percentage of the crop with wire. In the Southern Plains, Mountain, and Pacific regions, use of wire as tying material is still important. The proportion of wire-tie balers ranged from 30 percent in the Mountain region to 58 percent in

Table 10.--Number of farms reporting windrowers or swathers, number on farms, and percentage by type of machine, farm production region, type of farm, and annual gross sales of farmers, United States, 1964 1/

Item	Number of--		Percentage by type	
	Farms	Windrowers and swathers	Pull	Self-propelled
	Thousands		Percent	
Region:				
Northeast	3.9	3.9	79	21
Lake States	26.8	27.3	80	20
Corn Belt	12.8	12.8	92	8
Northern Plains	36.5	38.9	77	23
Southern Plains	4.4	4.9	74	26
Mountain	7.5	7.6	28	72
Pacific	3.3	3.7	23	77
Other regions 2/	4.8	4.9	100	--
All regions	100.0	104.0	75	25
Type of farm:				
Cash grain	26.8	29.2	75	25
Dairy	23.2	23.5	73	27
Livestock	16.2	16.2	89	11
Livestock ranches	7.3	7.4	76	24
General	23.3	24.5	67	33
Other farm types 3/	3.2	3.2	86	14
All farm types	100.0	104.0	75	25
Annual gross sales:				
$40,000 or more	11.6	13.1	51	49
$20,000 to $39,999	21.9	22.8	67	33
$10,000 to $19,999	40.6	41.6	81	19
$5,000 to $9,999	24.9	25.5	85	15
$2,500 to $4,999 4/	1.0	1.0	100	--
All sales groups	100.0	104.0	75	25

1/ Excludes Alaska and Hawaii. Fruit and nut, and vegetable farms are excluded.
2/ Appalachian, Southeast, and Delta States region.
3/ Tobacco, cotton, other field crops, and poultry.
4/ Includes farms in the Appalachian, Southeast, and Delta States regions only.

the Southern Plains (table 11).

Since much of the hay is fed on farms where it is grown, and twine is the tying material used extensively to tie bales for local use, 90 percent of the balers were twine-tie.

With regard to distribution of balers by type of farm, farms where feeding of livestock is extensive had mainly twine-tie balers. Dairy farms had 96 percent of the balers in this category and livestock farms 92 percent.

Large farms and ranches have the acreage to produce large amounts of hay. On farms with $40,000 or more of sales in 1964, 20 percent of the balers were wire-tie; 98 percent of the balers on small farms were twine-tie.

Forage Harvesters

About 125 million tons of various forage materials are processed annually by forage harvesters. The two types available are commonly referred to as (1) cylinder or flywheel and (2) flail.

For chopping corn silage, the most extensive operation, cylinder harvesters are used. The flail type is popular for chopping forage for green feeding.

Cylinder-type harvesters, introduced earlier (1936) than flail-type, ranged from 61 percent of the total in the Pacific States to 91 percent in the Northern Plains in 1964 (table 12). Flail-type harvesters, introduced in 1952, accounted for about half the total shipments in 1960 and 1961 but have ranged from 15 to 35 percent of the total since then. This type represented 21 percent of the total number on farms in 1964.

Concerning type of farm, cylinder- or flywheel-type forage harvesters represented 75 percent of those on dairy farms and 86 percent of those on other livestock farms. Wider usage of flail-type machines on dairy farms reflects greater usage of grass silage and green chop on these farms.

Preference for cylinder-type machines was stronger on small farms than on large ones, the proportion ranging from 86 percent of the total on small farms to 77 percent on farms with $20,000 or more of sales.

Cotton Strippers

Although successful cotton strippers were available long before cotton pickers, strippers made little headway until the early 1940's. Leaves and trash collected along with the bolls were a problem at gins.

Cotton strippers worked well in areas such as the High Plains of Texas, where hand snapping was a common practice. Even today, stripping cotton is largely confined to this general area. In 1964, 95 percent of the strippers were in the Southern Plains (table 13).

Most of the cotton strippers used in 1964 were two-row machines. The two-row size accounted for 94 percent of the total in the Southern Plains, 97 percent of those on cotton farms, and about 96 percent on farms with more than $10,000 of sales.

Table 11.--Number of farms reporting pickup balers, number on farms, and percentage by type of tie, by farm production region, type of farm, and annual gross sales of farmers, United States, 1964 1/

Item	Number of--		Percentage by type	
	Farms	Balers	Twine-tie	Wire-tie
	Thousands		Percent	
Region:				
Northeast	70.0	72.0	98	2
Lake States	120.1	120.6	98	2
Corn Belt	168.4	170.0	89	11
Northern Plains	62.8	64.0	88	12
Appalachian	52.8	53.3	97	3
Southeast	8.4	8.5	97	3
Delta States	10.6	10.8	100	--
Southern Plains	16.1	17.0	42	58
Mountain	33.3	35.7	70	30
Pacific	13.3	14.8	56	44
All regions	555.8	566.7	90	10
Type of farm:				
Cash grain	73.9	75.4	82	18
Tobacco	19.5	19.8	99	1
Cotton	10.0	10.0	77	23
Other field crops	2.8	2.8	92	8
Dairy	226.8	230.1	96	4
Livestock	122.8	124.1	92	8
Livestock ranches	11.1	12.1	78	22
General	88.9	92.4	78	22
All farm types	555.8	566.7	90	10
Annual gross sales:				
$40,000 or more	55.0	59.5	80	20
$20,000 to $39,999	119.5	121.3	89	11
$10,000 to $19,999	220.1	222.3	91	9
$5,000 to $9,999	149.5	151.9	91	9
$2,500 to $4,999 2/	11.7	11.7	98	2
All sales groups	555.8	566.7	90	10

1/ Excludes Alaska and Hawaii. Fruit and nut, and vegetable farms are excluded.
2/ Includes farms in the Appalachian, Southeast, and Delta States regions only.

Table 12.--Number of farms reporting forage harvesters, number on farms, and percentage by type of harvester, by farm production region, type of farm, and annual gross sales of farmers, United States, 1964 1/

Item	Number of--		Percentage by type of harvester	
	Farms	Forage harvesters	Cylinder or flywheel	Flail
	Thousands		Percent	
Region:				
Northeast	45.4	56.9	75	25
Lake States	68.6	81.4	75	25
Corn Belt	56.5	62.0	79	21
Northern Plains	44.1	46.7	91	9
Appalachian	12.7	13.7	88	12
Southeast	3.1	3.4	80	20
Delta States	2.8	3.2	84	16
Southern Plains	4.1	4.7	80	20
Mountain	12.2	13.5	83	17
Pacific	5.5	6.5	61	39
All regions	255.0	292.0	79	21
Type of farm:				
Cash grain	20.9	22.5	83	17
Dairy	140.5	167.9	75	25
Other livestock	42.1	45.8	86	14
Livestock ranches	6.4	7.0	81	19
General	40.5	44.1	82	18
Other farm types 2/	4.6	4.7	79	21
All farm types	255.0	292.0	79	21
Annual gross sales:				
$40,000 or more	37.7	44.2	77	23
$20,000 to $39,999	68.3	80.9	77	23
$10,000 to $19,999	101.8	115.1	79	21
$5,000 to $9,999	44.6	49.2	84	16
$2,500 to $4,999 3/	2.6	2.6	86	14
All sales groups	255.0	292.0	79	21

1/ Excludes Alaska and Hawaii. Fruit and nut, and vegetable farms are excluded.
2/ Tobacco, cotton, other field crops, and poultry.
3/ Includes farms in the Appalachian, Southeast, and Delta States regions only.

Table 13.--Number of farms reporting cotton strippers, number on farms, and percentage by row size, by farm production region, type of farm, and annual gross sales of farmers, United States, 1964 1/

Item	Number of--		Percentage by size	
	Farms	Cotton strippers	One-row	Two-row
	Thousands		Percent	
Region:				
Southern Plains	32.5	38.1	6	94
Other regions 2/	1.5	1.9	12	88
All regions	34.0	40.0	6	94
Type of farm:				
Cotton	24.5	29.2	3	97
Other farm types 3/	9.5	10.8	14	86
All farm types	34.0	40.0	6	94
Annual gross sales:				
$40,000 or more	4.5	7.3	3	97
$20,000 to $39,999	9.9	11.7	5	95
$10,000 to $19,999	9.9	10.6	4	96
$5,000 to $9,999	9.7	10.4	11	89
$2,500 to $4,999 4/	--	--	--	--
All sales groups	34.0	40.0	6	94

1/ Excludes Alaska and Hawaii. Fruit and nut, and vegetable farms are excluded.
2/ Appalachian and Mountain.
3/ Cash grain, dairy, other field crops, and general.
4/ Includes farms in the Appalachian, Southeast, and Delta States regions only.

Relatively inexpensive, the stripper enabled rapid mechanization of the cotton harvest in the Southwest after gins were equipped to handle machine stripped cotton.

Since a two-row stripper harvests about as much cotton as 20 hand snappers, a rapid decline in the need for hand labor resulted. In the 1949-50 season, only 2 percent of the cotton in Oklahoma was machine harvested; in Texas, the proportion was 11 percent. In the 1964-65 season, machine stripping accounted for 75 percent of the cotton harvested in Oklahoma and 64 percent in Texas.

In 1964, 40,000 mechanical strippers harvested cotton that would have required about 0.7 million hand snappers at 10 per row of machine harvesting.

Cotton Pickers

The cotton picker, one of the greatest laborsaving machines of all time, went into commercial production in 1941. Ten years later (in the 1951-52 season), California harvested more than half of the State's cotton crop with pickers. For the United States, however, only 15 percent was picked by machine. Labor was still not a great problem in the South, and there were problems of adjustment at gins with regard to handling machine-picked cotton. However, from 1951 to 1964, machine picking moved forward rapidly. In the 1964-65 season, 58 percent of the cotton in the United States was machine picked and 19 percent was machine stripped.

Many of the earlier pickers were one-row mounted machines, and a large number of these machines, along with some pull types, were still in use in 1964 (table 14).

High-capacity, self-propelled pickers were most numerous in the Delta States, the 7,500 there amounting to one-third of the pickers in that region. In the Corn Belt (mainly Missouri), 43 percent of the pickers were two-row, self-propelled but the total number was relatively small.

Cotton farms had 67 percent of the pickers in 1964, with nearly one-third of the total being two-row self-propelled units. While the remaining third of the pickers were scattered among several types of farms, most of them were on other livestock, and general farms.

In terms of annual gross sales, farms with $40,000 or more had nearly one-half the total number of cotton pickers; 42 percent were two-row self-propelled machines. Even on these farms, an equal percentage were one-row pull and mounted pickers. A few of the two-row machines were on the small farms but the operators probably did a lot of custom picking with them.

A one-row picker will pick as much cotton as 25 men picking by hand. Estimates from this study indicate that about 35,000 one-row pickers and 18,000 two-row pickers were in use in 1964. On the basis of 25 hand pickers per row of mechanized picking, it would have taken about 1.7 million workers to pick the cotton harvested by mechanical pickers in 1964.

Table 14.--Number of farms reporting cotton pickers, number on farms, and percentage by row size and type, by farm production region, type of farm, and annual gross sales of farmers, United States, 1964 1/

Item	Number of--		One-row		Two-row	
	Farms	Cotton pickers	Pull and mounted	Self-propelled	Mounted	Self-propelled
	Thousands		Percent			
Region:						
Corn Belt	2.9	2.9	48	5	4	43
Appalachian	8.0	9.5	61	9	1	29
Southeast	6.0	7.0	70	4	12	14
Delta States	17.1	22.7	60	4	3	33
Southern Plains	1.7	2.2	56	17	2	25
Mountain	2.7	3.8	14	36	21	29
Pacific	2.4	4.9	68	12	6	14
All regions	40.8	53.0	58	9	5	28
Type of farm:						
Cotton	26.5	35.8	55	8	6	31
Other farm types 2/	14.3	17.2	65	10	4	21
All farm types	40.8	53.0	58	9	5	28
Annual gross sales:						
$40,000 or more	15.1	24.9	42	9	7	42
$20,000 to $39,999	11.1	12.5	65	9	3	23
$10,000 to $19,999	9.7	10.2	77	9	4	10
$5,000 to $9,999	3.7	4.0	80	8	3	9
$2,500 to $4,999 3/	1.2	1.4	89	2	1	8
All sales groups	40.8	53.0	58	9	5	28

1/ Excludes Alaska and Hawaii. Fruit and nut, and vegetable farms are excluded.
2/ Cash grain, tobacco, other field crops, dairy, other livestock, and general.
3/ Includes farms in the Appalachian, Southeast, and Delta States regions only.

CROP DRIERS

In this study, three principal systems or methods of crop drying were considered: (1) batch or continuous flow; (2) in-storage, layer; and batch-in-bin. Batch or continuous flow systems have high capacity and turn out a high-quality product when properly operated. In-storage, layer drying is the least costly method but is relatively slow. Batch-in-bin driers combine the advantages of batch drying and in-storage drying, with the bin becoming an in-storage drier after other storage bins are filled.

Once it is decided to use a drier, decisions relating to costs and to drying capacity needed will help determine the type of drier to purchase.

In 1964, batch or continuous flow represented 25 percent of the total of 120,000 driers; in-storage, layer, 33 percent; and batch-in-bin, 42 percent (table 15). Since corn is the principal grain crop dried, 40 percent of the total driers were in the Corn Belt. In-storage, layer driers predominated here, accounting for 41 percent of the total in the region. Most of the driers in the Appalachian and Delta States were batch-in-bin driers, which are popular for drying rice and peanuts.

Considering type of farm, cash grain farms lead with half the driers; and the batch-in-bin type was the most commonly used--41 percent of the total on these farms. Livestock farms had about 25 percent of the driers, followed by general farms with nearly 15 percent. Batch-in-bin driers were most commonly used on both of these types of farms, representing 45 percent of the total.

Farms with $10,000 or more of gross sales had 95 percent of the driers in the survey. Large farms ($40,000 or more of sales) had more batch-in-bin type driers than either of the other types of driers--46 percent. This was also true for farms with sales of $10,000 to $39,999; however, on these farms, in-storage, layer driers were nearly as common as batch-in-bin--37 percent for the former and 39 percent for the latter. Relatively few driers were on small farms and those few were principally batch-in-bin and in-storage, layer types.

Table 15.--Number of farms reporting crop driers, number on farms, and percentage by type of drier, by farm production region, type of farm, and annual gross sales of farmers, United States, 1964 1/

Item	Number of--		Percentage by type of drier		
	Farms	Driers	Batch or continuous flow	In-storage layer	Batch-in-bin
	Thousands		Percent		
Region:					
Northeast	5.5	5.8	14	52	34
Lake States	10.2	11.3	44	23	33
Corn Belt	48.7	54.0	27	41	32
Northern Plains	22.7	25.0	27	33	40
Appalachian	10.2	15.0	7	10	83
Delta States	2.8	4.9	15	12	73
Other regions 2/	2.9	4.0	24	48	28
All regions	103.0	120.0	25	33	42
Type of farm:					
Cash grain	45.2	58.8	28	31	41
Other field crops	2.2	2.5	23	10	67
Dairy	10.6	10.8	28	45	27
Other livestock	25.5	27.5	21	34	45
General	16.3	17.2	22	33	45
Other farm types 3/	3.2	3.2	24	35	41
All farm types	103.0	120.0	25	33	42
Annual gross sales:					
$40,000 or more	32.8	40.8	28	26	46
$20,000 to $39,999	35.5	40.6	24	37	39
$10,000 to $19,999	28.9	32.7	24	37	39
$5,000 to $9,999	5.4	5.5	18	37	45
$2,500 to $4,999 4/	0.4	0.4	10	40	50
All sales groups	103.0	120.0	25	33	42

1/ Excludes Alaska and Hawaii. Fruit and nut, and vegetable farms are excluded.
2/ Southeast, Southern Plains, Mountain, and Pacific regions.
3/ Tobacco and cotton farms, and livestock ranches.
4/ Includes farms in the Appalachian, Southeast, and Delta States regions only.

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Appendix table 1.--Estimated average horsepower of tractors by plow bottom rating, United States

Plow bottoms	Estimated average horsepower	
	Maximum	Rated
Number:		
1 and 2	25	22
3 and 4	45	40
5 and 6	75	65
7 and over	100 and over	90 and over

Sources: Stone and Gulvin, Machines for Power Farming, John Wiley and Sons, Inc., New York City 1957; Nebraska tests; and Implement and Tractor Publications, Inc., 1969, Farm Equipment Red Book.

Appendix table 2.--Tractor cost per hour on 38 Ohio commercial farms, 1967

Annual hours of use	Size of tractors (plow bottoms)				
	Two or less	Two or three	Three or four	Four or five	Five or six
	Dollars				
Less than 100	2.75	5.75	7.50	1/	1/
100-200	2.35	3.80	4.56	6.63	1/
200-300	1/	3.09	3.70	3.33	5.15
300-400	1.13	2.07	2.82	3.39	4.24
400-500		2.35	2.13	3.44	3.82
500-600				2.38	3.66
600-700				2.37	3.33
Over 700					3.18

1/ No data available.

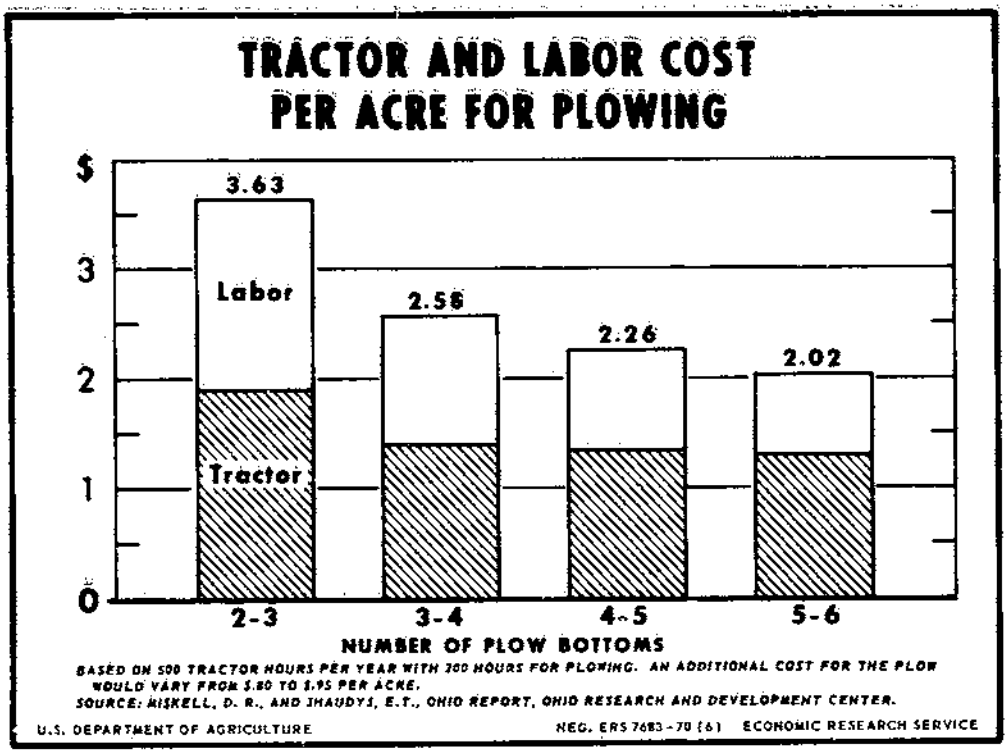

Figure 1

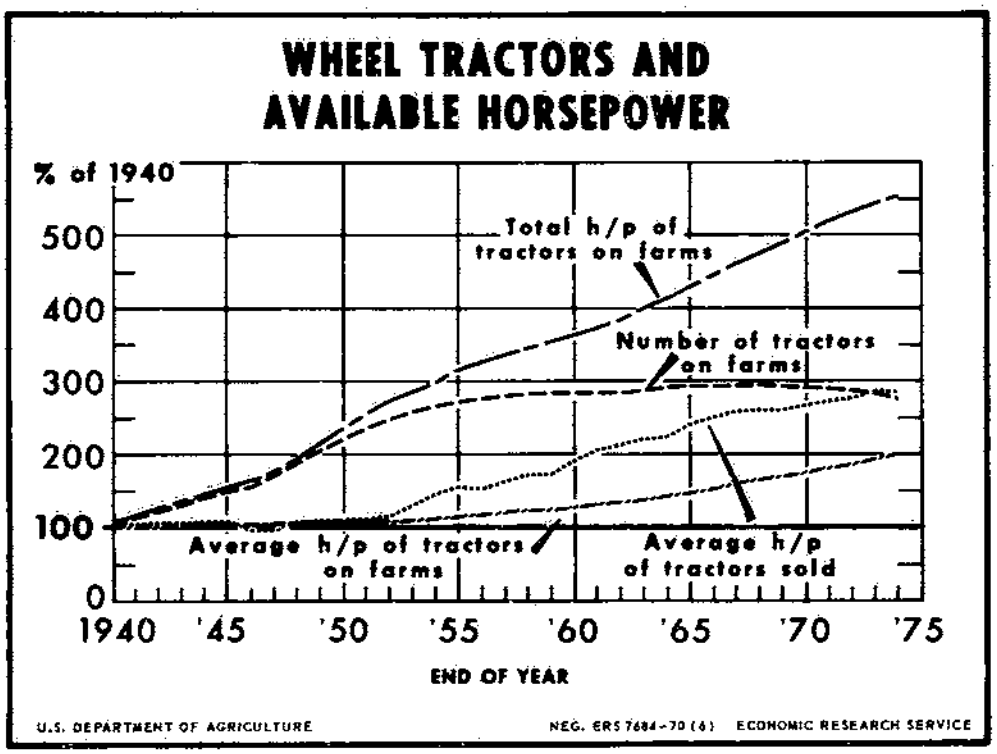

Figure 2

* U. S. GOVERNMENT PRINTING OFFICE : 1970—434-914/ERS-6

QUESTIONNAIRE USED IN ERS 1964 PESTICIDE AND GENERAL FARM SURVEY

Item and Description	Type and/or Size	CODE	Number	OFFICE USE
(1)	(2)	(3)	(4)	
77 TRACTORS: Plow Bottom Ratings:	1 - 2 Bottom---1 = Wheel 2 = Crawler			
	3 - 4 Bottom---1 = Wheel 2 = Crawler			
	5 - 6 Bottom---1 = Wheel 2 = Crawler			
	Over 6 Bottom--1 = Wheel 2 = Crawler			77
78 PLANTERS: Row Size:	1 = 1-2 Row 2 = 3 or more Rows			
GRAIN COMBINES: Type:	1 = Pull 2 = Self-prop. Width-- Ft.			
CORN HEADS FOR COMBINES: Row Size:	2 Row			
	Over 2 Row			
CORN PICKER: Row Size:	1 Row---1 = Pull 2 = Mounted			
	2 Row---1 = Pull 2 = Mounted 3 = Self-prop.			
CORN PICKER SHELLER: Row Size:	1 Row---1 = Pull 2 = Mounted			
	1 Row---1 = Pull 2 = Mounted			
CROP DRYERS:	1 = Batch or Continuous Flow 2 = Instorage, Layer 3 = Batch-in-bin			
FORAGE HARVESTERS: Type:	1 = Cylinder or Fly-wheel 2 = Flail			
PICKUP HAY BALERS: Type:	1 = Twine 2 = Wire			
WINDROWERS/SWATHERS: Type:	1 = Pull 2 = Self-propelled			
HAY CONDITIONERS: Type:	1 = Crimper 2 = Crusher			78
79 COTTON PICKER: Row Size:	1 Row---1 = Pull 2 = Mounted 3 = Self-prop.			
	2 Row---1 = Pull 2 = Mounted 3 = Self-prop.			
COTTON STRIPPERS: Row Size:	1 = Row 2 = 2 Row			79

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